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# Brown-Spot Needle Blight of Longleaf Pine

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Brown-spot needle blight, caused by the fungus *Scirrhia acicola* (Dearn.) Siggers, is the most serious disease of longleaf pine seedlings. By delaying growth and killing seedlings, it causes a total annual growth loss estimated to equal 16 million cubic feet of timber. Damage is worst on seedlings in nursery beds and on planted or natural seedlings still in the grass stage, *i.e.*, that have not begun height growth. Seedlings badly brown spotted usually linger in the grass for 10 years or more and may eventually die (fig. 1). Where the disease flourishes unchecked, the establishment of longleaf stands by planting, direct seeding, or natural regeneration is prevented or seriously delayed.

Destruction by brown spot can be avoided. Controls have been developed for the disease, both in the nursery and in the field. When infections are held in bounds, seed-

lings will begin rapid growth at 3 or 4 years of age. Once they reach a height of 30 inches, they are safe from all but the worst epidemics.

## Hosts and Distribution

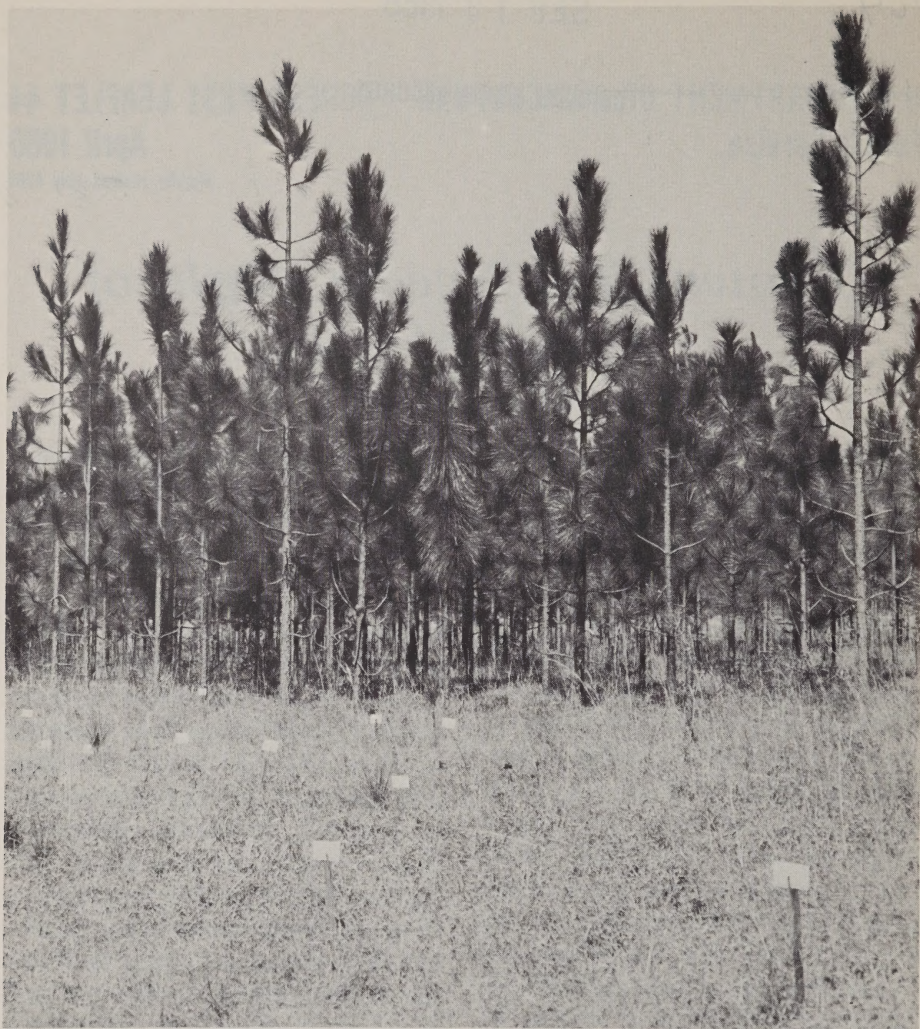
Brown spot has been found wherever longleaf pine grows in the United States. Its range includes all the Coastal States from Virginia to Texas. It also occurs on other pine species in the Coastal area, and in Arizona, Arkansas, Delaware, Ohio, Oregon, and Tennessee. The hosts include at least 24 pine species, 10 of which are native to the Southeast. The others are native to Western United States or Europe and have been introduced as exotics into southern nurseries, where the disease is usually present. On species other than longleaf, the disease is seldom serious. Recently it has been abundant on loblolly pines of all sizes, but its effects on this host are unassessed.

## Symptoms

*Scirrhia acicola* causes two kinds of needle spots. The common type is straw yellow at first, and later changes to a light brown, often with chestnut-brown borders (fig. 2). Dark-purplish borders are common

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**Figure 1.**—Thrifty longleaf saplings in the background were planted 10 years ago. Their foliage was protected by fungicidal spray until they began vigorous height growth. In the foreground, white cards mark seedlings planted at the same time but not protected from brown spot.

after the advent of cool weather in autumn. Several circular spots frequently run together to form irregular oblong areas. Individual spots are usually about one-eighth inch in diameter. When the needle dies, the green tissues between the spots shrink more than the diseased areas, and the resulting embossed appear-

ance of needles is the most distinctive symptom.

Less common is the needle discoloration called bar spot. It is a combination of a brownish spot on an amber yellow band about one-eighth inch wide. The tissues between the bands often remain green. Bar spots are infiltrated with resin





Figure 2.—Brown-spot infected needles of longleaf pine.

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that prevents normal growth and fruiting of the fungus. Typical bar spots are most common on trees in active height growth. There are all gradations between the two types of lesion.

### **Life History and Pathogenicity of the Fungus**

As far as is known, the fungus causing brown spot passes its entire life on pines, spreading from pine to pine by means of spores.



The sexual spores, called ascospores, mature at any time within 2 to 3 months after infected needle tissues die. Ascospores are wind-borne and cause scattered infections, sometimes at great distances. They are probably the principal means by which brown spot starts in nursery beds and plantations established with disease-free seedlings. These spores also reinfect areas of planted or natural reproduction freed of brown spot by burning, and they cause infections in the crowns of saplings and larger trees.

Once the fungus is established in an area, it intensifies and spreads each spring by asexual spores, conidia. These are exuded in gelatinous masses that are washed or splashed by rain. Conidia cause primary infections near the tips of young elongating needles, usually in April. By May spores produced on the new needles have caused secondary infections, and in June the tips of the needles have begun to die back. With the gradual death of the extremities of the needles, the affected parts curve outward and down (fig. 3).

The fungus spreads internally through the nonspotted parts of the needles during the winter and spring. Such spread is particularly rapid in March and April, and causes small whitish flecks on the green parts of the needles. The affected needles yellow quickly and finally assume the orange-red hue of needles killed by fire.

### **Control**

In nurseries, brown spot is easily controlled by spraying the seedlings

with 4-4-50 bordeaux mixture (4 pounds copper sulfate, 4 pounds hydrated lime, and 50 gallons water). One pint of a sticker-spreader should be added per 100 gallons of formulation. Several commercial sticker-spreaders are available, but any liquid household detergent will serve as a spreader, and casein or wheat flour may be added as a sticker. Some other fungicides, such as ferbam, also have been used to control brown spot, but they are not as persistent as bordeaux mixture and are not recommended.

The formulation should be applied at a rate of 60 gallons per acre with a hydraulic sprayer operating at 300 p.s.i. Spraying should be at 2- to 4-week intervals from late May through October; the more frequent respraying is required during rainy periods. Usually, four to six applications a year are sufficient. A final spray just before lifting is important to insure freedom from the disease while seedlings are becoming established after planting. Dipping the tops of the bundled seedlings in the fungicidal solution already described is an alternative to the final spray. When any appreciable number of diseased seedlings are already present on the planting site, the area should be burned before planting.

Fungicidal sprays as used in nurseries are too expensive for controlling brown spot in plantations and natural reproduction. There is some evidence that one or two sprayings during each of the first 2 years after planting will give sufficient control to permit seedlings



to begin height growth, but further information is needed before field spraying can be recommended as a general practice.

Vigorous longleaf seedlings in the grass stage possess great ability to survive fire. Hence, carefully controlled burns of low intensity will scorch the needles, and thereby kill the fungus, without seriously damaging the seedlings.

Timing of such prescribed fires is important. Burns should not be

made at any set interval, but only when brown spot has developed to a damaging extent. In late November or December when one-third of the foliage is dead on most of the seedlings, a prescribed burn the following January or February is advisable. Postponing the fire for a year may delay height growth and increase mortality not only from the brown spot but also from the fire, for disease-killed needles (fig. 4) feed and intensify the flames.



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Figure 3.—Brown-spotted longleaf seedling 1 year after planting. The infected foliage curves outward and down.



The burns must also be made before any large percentage of the seedlings have started to elongate, because longleaf seedlings in early stages of height growth are vulnerable to fire, particularly if already weakened by brown spot. January and February are generally the best months for controlled burning, but local circumstances may indicate an earlier or later date.

Only a person thoroughly trained in the correct use of fire should attempt prescribed burning, for successful control depends on many factors. Nevertheless, fire is both cheap and effective, and hence is widely used throughout the longleaf pine belt. Currently it is the only method generally recommended for controlling the disease in the field.

Spraying with bordeaux mixture is recommended for checking brown spot on seedlings around the home, and in landscape plantings, small fields, and other places where burning is undesirable or impossible. This fungicide may be purchased at most garden and feed stores. Three or four applications, 8 to 10 weeks apart, beginning in May and ending in November, should suffice. The rates previously recommended for nursery control are adequate. A sticker-spreader should be used.

Occasionally an essentially disease-free seedling is found among heavily infected plants and there is evidence that resistance to brown-spot is genetically controlled. The development of resistant strains is

one of the objects of current research in forest genetics.

**Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.**

**Store pesticides in original containers—out of reach of children and pets—and away from food-stuff.**

**Apply pesticides selectively and carefully. Do not apply a pesticide when there is danger of drift to other areas. Bordeaux mixture is corrosive to metals, and spraying equipment should be thoroughly washed after use to prevent damage.**

**Avoid prolonged inhalation of a pesticide spray or dust. When applying a pesticide, it is advisable that you be fully clothed.**

**After handling a pesticide, do not eat, drink or smoke until you have washed. If a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label, and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.**

**Dispose of empty pesticide containers by wrapping them in several layers of newspaper and placing them in a rubbish disposal container.**

**It is difficult to remove all traces of a herbicide (weed killer) from equipment. Therefore, to prevent injury to desirable plants do not use the same equipment**





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Figure 4.—Brown-spotted (left) and healthy (right) longleaf pine seedlings. The accumulation of disease-killed needles around the base of the affected plant will intensify any fire intended to control brown spot.

for insecticides and fungicides that you use for a herbicide.

NOTE: Registrations of pesticides are under constant review by the U.S. Department of Agriculture. Use only pesticides that bear the USDA registration number and carry directions for your intended use.

## References

- The brown spot needle blight of pine seedlings. P. V. SIGGERS. U.S. Dep. Agr. Tech. Bull. 870, 36 p., illus. 1944.
- Planting the southern pines. PHILIP C. WAKELEY. U.S. Dep. Agr., Agr. Monog. 18,233 p., illus. 1954.
- Brown spot needle disease of pines. F. A. WOLF and W. J. BARBOUR. *Phytopath.* 31: 61-74, illus. 1941.



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